

- Appl. No. 09/751,215
Amendment dated February 4, 2004
Reply to Office Action of November 5, 2003

REMARKS

As a preliminary matter, in the Office Action mailed November 5, 2003, the Examiner did not attach an initialed copy of the PTO-1449 form references that were mailed to the PTO on July 16, 2003. As such, applicant respectfully requests that the Examiner indicate that this reference has been considered and made of record.

Claims Objections

The Examiner has objected to informalities in claims 4-6. Claims 4-6 have been amended to overcome the objections.

Claim Rejections – 35 U.S.C. § 102

The Examiner has rejected claim 1 under 35 USC 102(e) as being anticipated by Hsiung et al. (U.S. Patent No. 6,174,812). The Applicant respectfully traverses. Hsiung does not teach or anticipate all of the elements of the Applicant's claims. In particular, Hsiung does not teach the element of claim 1 of "depositing a metal layer comprising copper and an additional metal species over a semiconductor wafer surface wherein said copper and said additional metal species are **co-deposited**." In contrast, Hsiung teaches first depositing copper and then depositing an additional metal, palladium, in a separate layer followed by an anneal to mix the copper and palladium together into one alloy. This is described in Col. 3 lines 27 – 30: "[A] copper gap-fill electroplating layer 33 is electroplated over the IMD layer gap 30. Then, a palladium layer 34 is sputtered over the copper layer 33." Therefore, Hsiung does not teach co-depositing copper and an additional metal species as claimed by the Applicant. The Applicant respectfully submits that claim 1 is not anticipated by Hsiung.

Claim Rejections – 35 U.S.C. § 103

The Examiner has rejected claims 5 and 6 under 35 USC 103(a) as being unpatentable over Hsiung et al. ('812) in view of Besser (U.S. Patent No. 6,368,967). The Applicant respectfully traverses. The cited references, either individually or in combination, fail to teach or render obvious all elements of the Applicant's claims. In particular, the references do not teach the element of independent claim 5 of "allowing the heated metal film to cool, so as to form precipitates of said introduced metal species; and after allowing said heated metal film to cool performing chemical-mechanical polishing wherein said additional metal precipitate hardens said deposited metal film to reduce the rate of said polishing." Both Hsiung and Besser fail to teach forming precipitates of the introduced metal species. Hsiung teaches sputtering palladium over a copper layer and forming a homogeneous Cu-Pd alloy. Besser fails to teach introducing an additional metal species to copper at all, much less forming a precipitate from an introduced metal species. Therefore, the Applicant respectfully submits that the independent claim 5 and claim 6 that depends upon and incorporates the elements of claim 5 are obvious in light of Hsiung in view of Besser.

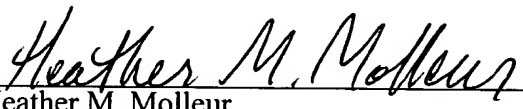
The Examiner has rejected claims 18, 19 and 21 under 35 USC 103(a) as being unpatentable over Hsiung et al. ('812) in view of Pramanick et al. (U.S. Patent No. 6,117,770). The Applicant respectfully traverses. The cited references, either individually or in combination, fail to teach or render obvious all elements of the Applicant's claims. In particular the cited references fail to teach the element of claim 18 of "co-depositing a metal film and an additional metal species over said insulating layer and in said opening and filling said opening with said metal film and said additional metal species." As described above, Hsiung fails to teach co-depositing a metal film and an additional metal species and Pramanick teaches implanting a conductive material with an alloying element after the conductive material has already been deposited and planarized. Therefore, the Applicant respectfully submits that the independent claim 18 and the claims 19 and 21 that depend upon and incorporate the limitations of claim 18 are not obvious in light of Hsiung in view of Pramanick.

If there are any additional charges, please charge Deposit Account No. 02-2666.

Respectfully submitted,

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